

REMARKS

Claims 2-14, 16-20 and 22 are all the claims pending in the application. Claim 2 is hereby amended to include the content of claims 15 and 21, and claims 1, 15 and 21 are cancelled.

Although claim 21 was rejected over Sato '410, Sato '411, Sinopoli, Gummiwerke and Kanamaru in numbered paragraph 6 of the Office Action, Applicants respectfully submit that this rejection is overcome by the following remarks.

It appears that the Examiner is of the opinion that the structure of the second and third embodiments of the present invention would have been obvious from the combination of the basic pneumatic tire structure allegedly taught by Sato '410, Sato '411; an additional rubber layer allegedly taught by Sinopoli or Gummiwerke; and the "100% tensile stress" characteristic allegedly taught by Kanamaru.

However, the rubber layers of Sinopoli and Gummiwerke are applied to a tire for objects completely different from the object for which the reinforcing layer (7) of the present invention is provided. Due to these differences in objects, the resulting structures of the rubber layers of Sinopoli and Gummiwerke are significantly different from that of the reinforcing layer (7) of the present invention.

First, in Sinopoli, "an optional thick cushion compound (17)" is provided in order to prevent exposure, by puncture, of the steel reinforcement cords of the belt package to water and air, which can cause the belt package to corrode (lines 12-14 of column 1 of Sinopoli). In order to fulfill this object, the optional thick cushion compound (17) must be positioned "between the top

breaker (belt) and the next breaker (belt) radially below” (lines 7-10, column 5 of Sinopoli). If the thick cushion compound (17) were to be positioned otherwise, the cushion compound would not fulfill the aforementioned object (of preventing corrosion of the steel reinforcing cords).

On the contrary, the reinforcing layer (7) of the present invention is free of such a restriction as in Sinopoli (in other words, the location of the reinforcing layer (7) is not restricted to “between the top belt and the next belt radially below” at all), because the reinforcing layer (7) is provided in order to increase the circumferential direction rigidity of the belt (refer to the last paragraph on page 38 of the present specification), not in order to prevent corrosion of the steel reinforcement cords.

In Gummiwerke,¹ a rubber panel (10) is provided between “at least two superposed cord fabric plies 8 forming a cross bracing” and “a ply band 11 located thereabove made of filaments or the like.” However, note that, in Gummiwerke, “the filament or the like of the band 11 *in places* are more closely located to the plies 8 of the cross bracing than in the remaining regions of the belt” (claim 1 of Gummiwerke’s corresponding UK application), in order that “in the region of the edges, namely in an edge region comprising about 25% of the belt width, the ply 11 is located directly on the ply 8 so that herein a direct influence of the filaments 12 occurs and the possible movements at the free edges of the filaments 9 cannot occur in the edge region of the belt. In the center of the belt, however, a balancing out occurs which, during deformation of the

¹ Applicants submit herewith, for the Examiner’s benefit, a copy of Gummiwerke’s counterpart UK application.

belt, permits angular changes of the filaments 9 to take place (lines 20-29 on page 2 of Gummiwerke's corresponding UK application).

Conversely, the reinforcing layer (7) of the present invention is free of such a positional restriction in Gummiwerke as described above.

Further, with regard to Kanamaru, there is defined a specific range of the 100% modulus in order to prevent the belt-end separation. That is, Kanamaru is irrelevant to Sinopoli and Gummiwerke and, thus, combining Kanamaru with Sinopoli or Gummiwerke is utterly inappropriate.

In conclusion, Applicants respectfully submit that "the additional rubber layers" allegedly disclosed in Sinopoli and Gummiwerke are structurally different from the reinforcing layer (7) of the present invention. Further, Kanamaru is irrelevant to both Sinopoli and Gummiwerke. Thus, combining Sato '410, Sato '411 with Sinopoli, Gummiwerke and Kanamaru would not reach the structure defined by claim 2 as currently amended. In fact, the sheer number of references being combined in itself points to an inappropriate hindsight-type analysis.

In view of the preceding amendments and remarks, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby earnestly solicited. If there are any points remaining in issue that the Examiner feels may be best resolved through a personal or telephonic interview, he is kindly requested to contact the undersigned attorney at the local telephone number listed below.

AMENDMENT UNDER 37 C.F.R. §1.111
U.S. SERIAL NO. 09/853,674

ART UNIT 1733
Q62558

A Petition for a three-month Extension of Time with appropriate fee accompanies this document. The USPTO is directed and authorized to charge all additional required fees (except the Issue Fee and/or the Publication Fee) to our Deposit Account No. 19-4880. Please also credit any overpayment to said Deposit Account.

Respectfully submitted,



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PATENT TRADEMARK OFFICE

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APPENDIX
VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Claims 1, 15 and 21 are cancelled without prejudice and/or disclaimer.

The claims are amended as follows:

2. (Amended) A radial tire comprising:

a carcass layer formed of at least one radial carcass ply disposed between a pair of bead members;

a tread disposed at a tire radial direction outer side of a crown region of the carcass layer, and forming a ground-contact portion;

a belt layer formed of at least two belt plies each formed from rubber-coated metal wires, and disposed between the tread and the crown region of the carcass layer, the belt layer being structured such that, in at least one belt ply of the belt layer, at least a majority of metal wires in the ply exist as metal wire bundles in which a plurality of metal wires of circular cross-sections and substantially equal wire diameters are aligned in parallel without being twisted together, the metal wire bundles being aligned planarly and in parallel with intervals between the metal wire bundles in the width direction of the belt layer;

at least one cap layer in which organic fibers are covered with rubber and which is disposed between the tread and the belt layer;

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wherein at least one reinforcing layer, which is formed of rubber or whose main component is rubber, is disposed between the tread and the belt layer; and

wherein a 100% tensile stress of rubber portions of the reinforcing layer is higher than a 100% tensile stress of rubber of the tread.

A TREAD REINFORCING BELT IN A PNEUMATIC TYRE

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Applicant(s): CONTINENTAL GUMMI WERKE AG
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IPC Classification: B60C9/18
EC Classification: B60C9/18, B60C9/22
Equivalents: ☐ FR2399330, ☐ IT1097440

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Abstract

A tension-resistant belt 6 extending substantially over the width of the tread strip region 5 and being located between the radial carcass 1 and the tread strip region, comprises at least two superposed parallel cord fabric plies 7, 8 forming a cross-bracing and a ply 11 (band) located thereabove, the filaments of ply 11 subtending very small angles e.g. 0-5 DEG with the circumferential direction. In order to vary the influence of the ply 11 on the plies 7, 8 over the belt width, a rubber panel 10 is located between the plies 8 and 11, so that, seen in the transverse direction of the belt, the filaments of the band, in places, are more closely located to the plies of the cross-bracing than in the remaining region(s) of the belt. The panel preferably has a Shore A hardness of 45-70 and a thickness of 0.7 to 2.5 times that of plies 7 and 8. The filaments are preferably of material e.g. polyamide or polyester which shrinks during vulcanization. In section the panel may form a single hump, as shown, or a plurality of humps (Fig. 4 not

shown) 

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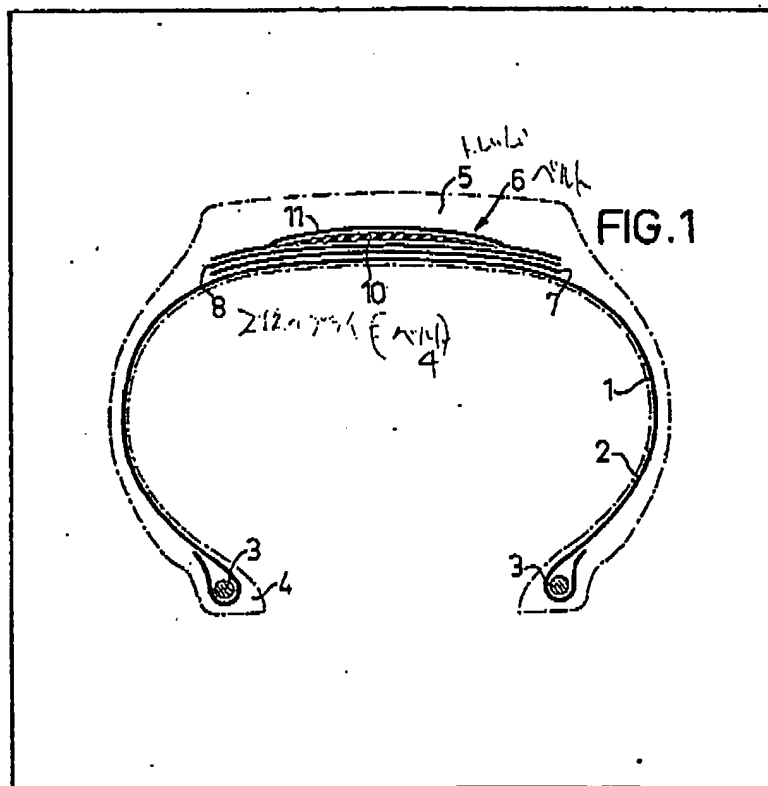
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(54) A TREAD REINFORCING BELT IN A PNEUMATIC TYRE

(57) A tension-resistant belt 6 extending substantially over the width of the tread strip region 5 and being located between the radial carcass 1 and the tread strip region, comprises at least two superposed parallel cord fabric plies 7, 8 forming a cross-bracing and a ply 11 (band) located thereabove, the filaments of ply 11 subtending very small angles e.g. 0—5° with the circumferential direction. In order to vary the influence of the ply 11 on the plies 7, 8

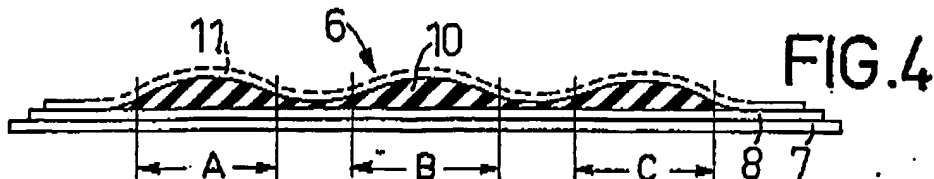
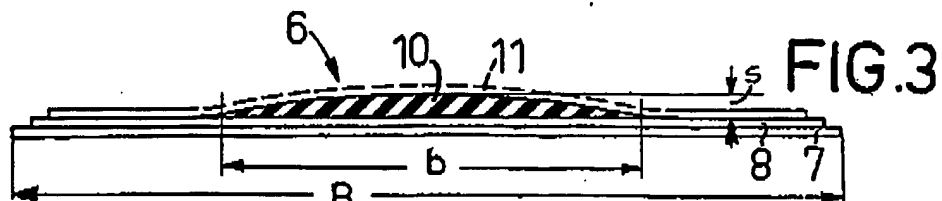
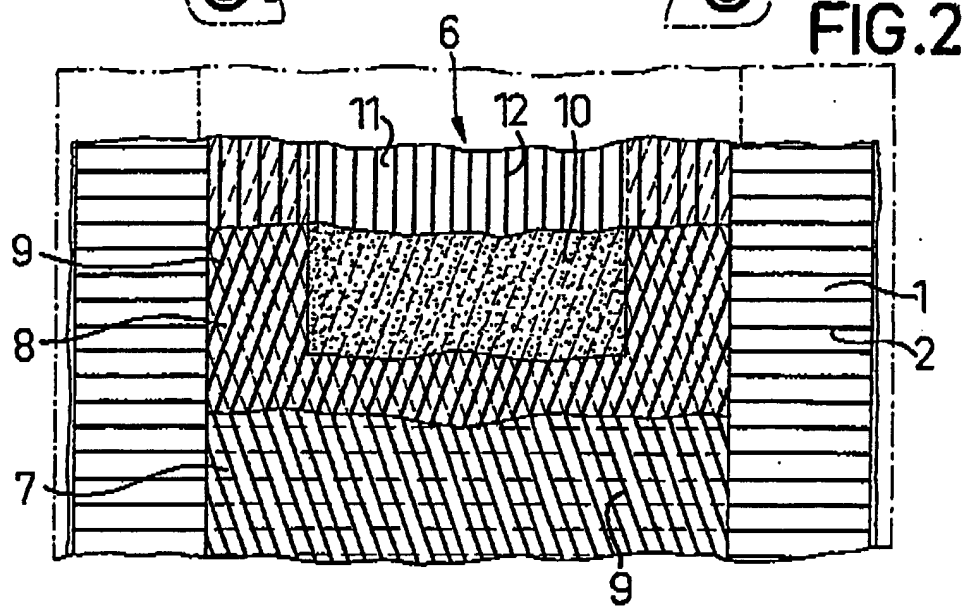
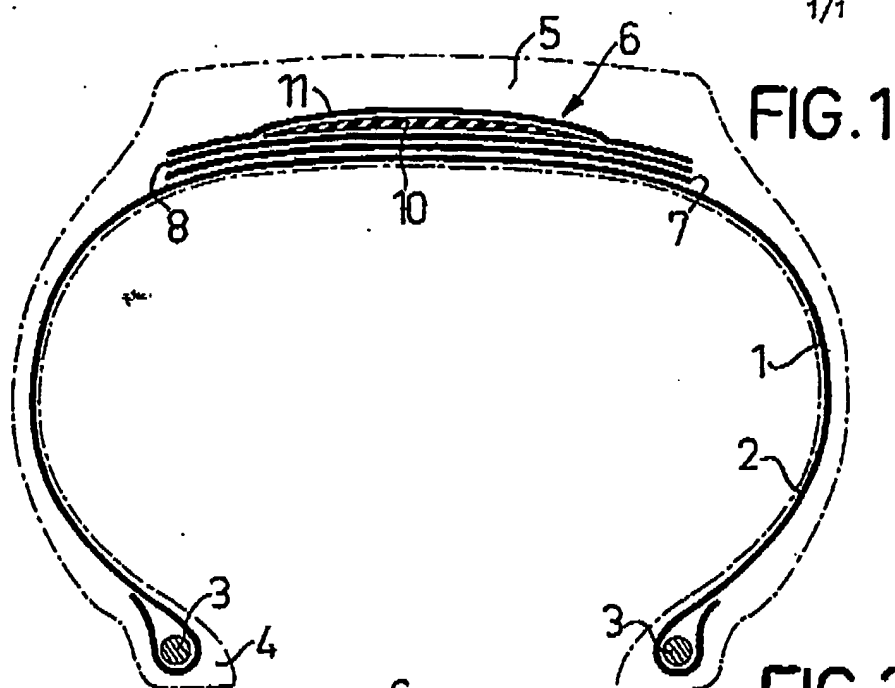
over the belt width, a rubber panel 10 is located between the plies 8 and 11, so that, seen in the transverse direction of the belt, the filaments of the band, in places, are more closely located to the plies of the cross-bracing than in the remaining region(s) of the belt. The panel preferably has a Shore A hardness of 45—70 and a thickness of 0.7 to 2.5 times that of plies 7 and 8. The filaments are preferably of material e.g. polyamide or polyester which shrinks during vulcanization. In section the panel may form a single hump, as shown, or a plurality of humps (Fig. 4 not shown)



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SPECIFICATION

PNEUMATIC VEHICLE TYRE

The present invention relates to a pneumatic vehicle tyre, more especially a pneumatic tyre having a radial carcass with a tension resistant belt extending substantially over the width of the tread strip region and being located between said carcass and said tread strip region, whereby the belt consists of at least two superposed cord fabric plies preferably forming a symmetrical cross bracing, more especially of steel wires, and a ply (band) located thereabove made of mutually tension-resistant filaments or the like, more especially of a heat-shrinking material, which filaments subtend small angles with the circumferential direction of the tyre, more especially angles of from 0 to 5°.

In known tyres of this type, the aforesaid band extends over the whole width of the belt and thus in such a manner that the filaments forming the tyre are equidistantly located from the reinforcing members of the adjacent ply of the cross bracing. The position of the band and the remaining plies of the belt, hence extend parallel to one another, so that the effects of a triangular cross bracing result over the whole width of the belt, whereby the filaments or the like of the band lock the cross bracing and thus prevent the reinforcing members of such bracing from executing scissor-like movements.

The invention is based on the knowledge that it is often desirable to use the influence of the band without having to abandon a continuous band ply, and which is easy to process during manufacture. Consequently, an object of the invention is based on fashioning of the aforesaid belt in such a manner that with a band ply extending at right angles, therethrough, the influence of the band ply may be directed at certain points of the belt utilising simple technical means.

According to the present invention there is provided a pneumatic vehicle tyre having a radial carcass with a tension resistant belt extending substantially over the width of the tread strip region and being located between said carcass and said tread strip region whereby the belt consists of at least two superposed cord fabric plies forming a cross bracing and a ply band located thereabove made of filaments or the like extending parallel to one another and which filaments subtend very small angles with the circumferential direction of the tyre, in which, between the plies forming the cross bracing and the ply forming the band, a panel made of rubber or rubber-like materials is located in such a manner that, seen in the transverse direction of the belt, on the filaments or the like of the band in places are closely located to the plies of the cross bracing than in the remaining regions of the belt.

The intermediate ply formed of rubber or rubber-like material is thus so adapted that the filaments or the like of the cross bracing are located closest to the band in the edge region of

the belt, more especially are located directly adjacent, which consequently leads to a triangular formation in the region of the belt edges in such a manner that the disadvantages created by the bevelled edges of the belt edges, more especially the movements of the filament ends are thereby eliminated, whilst in the region of the belt centre, the band on account of the ply located there, made of rubber or rubber-like materials has at most, a minimal effect.

The use of an intermediate ply in the aforesaid sense also permits an undulatory laying of the band, so that the latter, at more than two points, is located relatively close to the cross bracing, whereby a corresponding number of circumferential regions are created which are subject to the influence of the cross bracing, whilst in turn, in the regions located therebetween, the filaments or the like of the band have, at most, a minimal effect on the angular changes of the filaments or the like of the cross bracing, whereby better deformation of the belt is ensured.

The present invention will be further illustrated, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a radial part section through a pneumatic vehicle tyre in accordance with the present invention;

Fig. 2 is a partial plan view of the tread surface of the tyre of Fig. 1 showing its belt plies;

Fig. 3 is a schematic cross-sectional view of the belt for the tyre shown in Figs. 1 and 2, on an enlarged scale; and

Fig. 4 is a modified belt development corresponding to the view of Fig. 3.

The tyre body, formed substantially of rubber or rubber-like materials, has a carcass 1 of tension-resistant filaments 2 extending radially to the tyre, which filaments are anchored in the tyre bead region 4 by being looped around bead cores 3.

A tension-resistant belt 6 for stabilising the tyre body is located between the carcass 1 and the tread strip region 5 and extends substantially over the width of the tread strip region 5.

The belt 6, in its radially inner region, is formed by a cord fabric; for this purpose two superposed plies 7, 8, of rubberised steel wire fabric are provided. In each ply 7 and 8 the steel wires 9, having a diameter of about 0.8 to 1 mm, extend parallel to one another and subtend an angle of about 18 to 26° with reference to the circumferential direction of the tyre, in such a manner that the steel wires 9 of ply 7 extend in one diagonal direction and the steel wires 9 of ply 8 extend in the other diagonal direction relative to the circumferential direction of the tyre. The plies 7 and 8, including the rubberised portion have a wall thickness of about 1.5 mm.

A rubber panel 10 is located centrally and directly on ply 8. The width *b* of such panel 10 (Fig. 3) corresponds substantially to half the width *B* of the belt 6. Moreover, the panel 10 tapers into a point at its edges. It has a Shore hardness A of

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about 45 to 70, preferably a hardness of 60 Shore, and a wall thickness corresponding substantially to the wall thickness of the plies 7 and 8; however, the wall thickness S of the rubber panel 10 may also amount to 0.7 to 2.5 times that of the plies 7 and 8.

Directly adjacent to the rubber panel 10, there is a band in the form of a rubberised ply 11, which consists of a plurality of tension-resistant filaments 12 located parallel to one another and which extend substantially in the circumferential direction of the tyre. The filaments 12 are made of polyamide or polyester or a similar plastics material which shrinks at the vulcanisation temperature, whereby the band is formed as the external belt ply.

The ply 11 is located in the belt centre and is spaced from the cross-bracing or the two plies 7 and 8 by the centrally located mesher panel 10. However, in the region of the edges, namely in an edge region comprising about 25% of the belt width, the ply 11 is located directly on the ply 8 so that herein a direct influence of the filaments 12 occurs and the possible movements at the free edges of the filaments 9 cannot occur in the edge region of the belt. In the centre of the belt, however, a balancing out occurs which, during deformation of the belt, permits angular changes of the filaments 9 to take place.

In the embodiment shown in Fig. 4, the rubber panel 10 has an undulatory surface 12, so that balancing out results in the regions A, B and C, the influence of the ply 11 on the other hand in the two edge regions and in the circumferential rows between the sections A, B and C, is more forcefully retained, whereby it is understood that by a suitable undulatory surface configuration of the panel 10, the required degree of balancing out may be effected.

They may, of course also be regions provided between the sections A, B and C in which the band 11 is completely omitted.

CLAIMS

1. A pneumatic vehicle tyre having a radial carcass with a tension resistant belt extending substantially over the width of the tread strip region and being located between said carcass and said tread strip region whereby the belt consists of at least two superposed cord fabric

plies forming a cross bracing and a ply band located thereabove made of filaments or the like extending parallel to one another and which filaments subtend very small angles with the circumferential direction of the tyre, in which between the plies forming the cross bracing and the ply forming the band, a panel made of rubber or rubber-like materials is located in such a manner that, seen in the transverse direction of the belt, the filament or the like of the band in places are more closely located to the plies of the cross bracing than in the remaining regions of the belt.

2. A pneumatic vehicle tyre as claimed in claim 1, in which the ply of the band is directly adjacent, in the region of the belt edges, to the plies forming the cross bracing.

3. A pneumatic vehicle tyre as claimed in claim 1 or 2, in which the panel has acutely extending edges and, for this, has a wall thickness which is about from 0.7 to 2.5 times the diameter of the reinforcing members which form the cross bracing.

4. A pneumatic vehicle tyre as claimed in claim 3, in which the wall thickness is about 1.5 times the diameter of the reinforcing members.

5. A pneumatic vehicle tyre as claimed in any preceding claim, in which the panel is located centrally on the cross bracing and its width corresponds to half the width of the belt.

6. A pneumatic vehicle tyre as claimed in any preceding claim, in which the panel has a hardness of from about 55 to 70 Shore A.

7. A pneumatic vehicle tyre as claimed in claim 6, in which the hardness of the panel is about 60 Shore.

8. A pneumatic vehicle tyre as claimed in any preceding claim, in which all plies of the belt having reinforcing members are substantially of equal width.

9. A pneumatic vehicle tyre as claimed in any preceding claim, in which two or more panels are located spread over the width of the belt.

10. A pneumatic vehicle tyre as claimed in any preceding claim, in which the or each panel is provided which has an undulating surface by forming sections of varying wall thickness.

11. A pneumatic vehicle tyre substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.